

Neural network

Sec 1

[8]

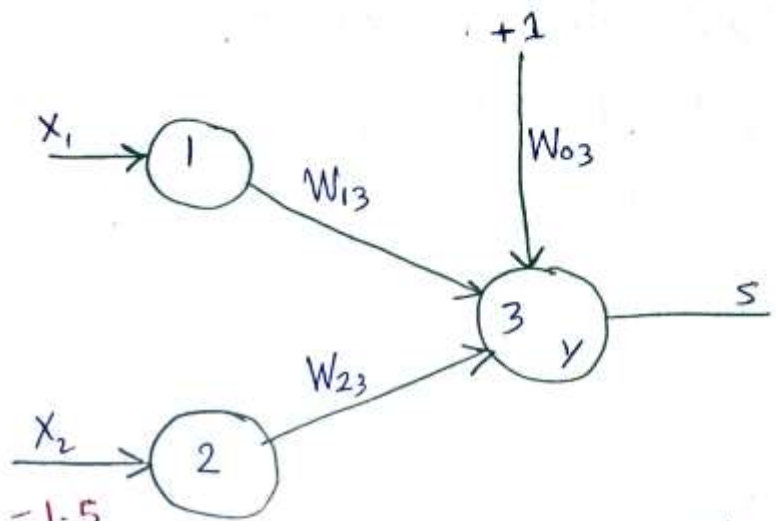
Activation Function or
threshold Function

$$S = \begin{cases} 1 & y \geq 0 \\ 0 & y < 0 \end{cases}$$

if $W_{13} = 2, W_{23} = 2, W_{03} = 1.5$

Prove that this is OR

$$\begin{aligned} Y &= X_1 W_{13} + X_2 W_{23} + W_{03} \\ &= 2X_1 + 2X_2 - 1.5 \end{aligned}$$



X_1	X_2	S
0	0	0
0	1	1
1	0	1
1	1	1

a) $X_1 = X_2 = 0$

$$Y = -1.5 < 0 \Rightarrow S = 0$$

b) $X_1 = 0, X_2 = 1$

$$Y = 0.5 > 0 \Rightarrow S = 1$$

c) $X_1 = 1, X_2 = 0$

$$Y = 0.5 > 0 \Rightarrow S = 1$$

d) $X_1 = 1, X_2 = 1$

$$Y = 2.5 > 0 \Rightarrow S = 1$$

\therefore This network is OR

as

$$(W_{13} \& W_{23}) > W_{03}$$

System is representing
OR circuit.

Design "Things we have to know before design"

- 1) no. of i/p and o/p. 3a) no. of neuron/layer.
- 2b) hidden layer (linear or non linear)
- 4) Activation Function / neuron.
- 5) weights \rightarrow (learning Algorithm)

Design of 2-input

① i/p = 2 , o/p = 1

② له نزي الرسم عندي خط وحيد يقدر
يعمل فعمل الدالة فتكونه
(linear)

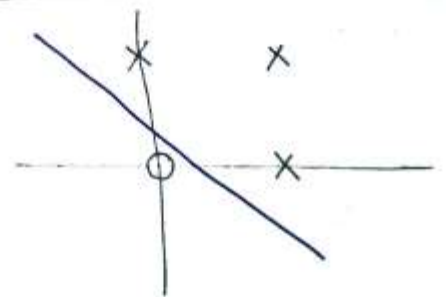
\therefore no hidden layer.

3) one neuron.

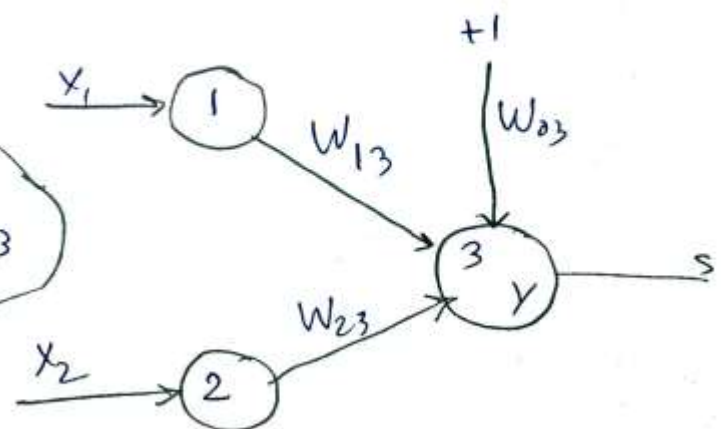
4) threshold function.

5) weights

x_1	x_2	s
0	0	0
0	1	1
1	0	1
1	1	1



$$Y = X_1 W_{13} + X_2 W_{23} + W_{03}$$



a) $X_1 = 0$ & $X_2 = 0 \longleftrightarrow S$ required to be 0

$$Y = W_{03} < 0$$

if $A \rightarrow +ve$ value

$$W_{03} = -A$$

لازم Y تكون أقل من الصفر
($S = 0$)
 $\therefore W_{03} < 0$

b) $X_1 = 0$ & $X_2 = 1 \longleftrightarrow S = 1$

$$Y = W_{23} + W_{03} > 0 \Rightarrow W_{23} > A$$

c) $X_1 = 1$ & $X_2 = 0 \longrightarrow S = 1$

$$Y = W_{13} + W_{03} > 0 \Rightarrow W_{13} > A$$

d) $X_1 = 1$ & $X_2 = 1 \longrightarrow S = 1$

$$Y = W_{13} + W_{23} + W_{03} > 0 \Rightarrow W_{13} + W_{23} > A$$

(And)

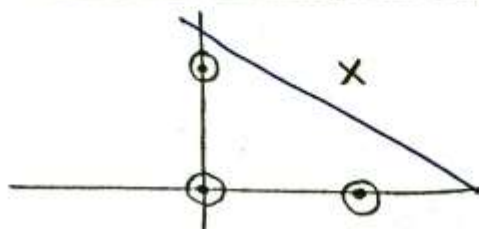
1) $ilp = 2$, $olp = 1$

2) no hidden layer

3) one neuron

4) threshold function

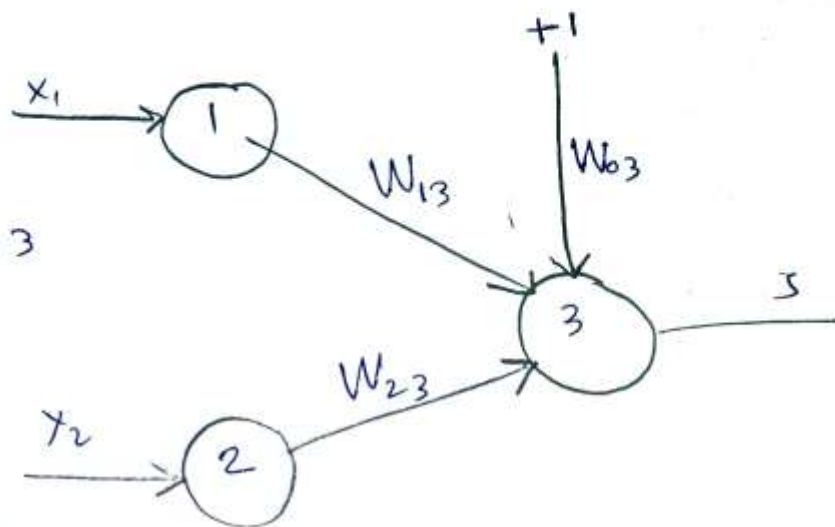
X_1	X_2	S
0	0	0
0	1	0
1	0	0
1	1	1



Let:

$$W_{03} = -10, W_{23} = 8, W_{13} = 3$$

لن بحث أنه الحد الأقصى
الذي سينتج خرج هو أنه
 W_{23}, W_{13} متجهين يسكنوا
أكبر من W_{03} .



$$Y = W_{13} X_1 + W_{23} X_2 + W_{03}$$

a) $X_1 = 0, X_2 = 0 \rightarrow S = 0$

$$Y = W_{03} < 0 \Rightarrow W_{03} = -A$$

b) $X_1 = 0, X_2 = 1 \rightarrow S = 0$

$$Y = W_{23} + W_{03} < 0 \Rightarrow W_{23} < A$$

c) $X_1 = 1, X_2 = 0 \rightarrow S = 0$

$$Y = W_{13} + W_{03} > 0 \Rightarrow W_{13} < A$$

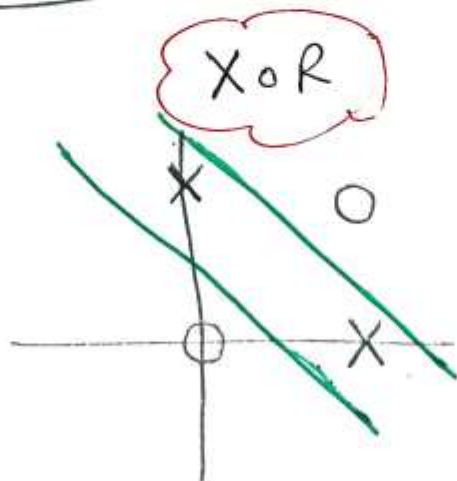
d) $X_1 = 1, X_2 = 1 \rightarrow S = 0$

$$Y = W_{13} + W_{23} + W_{03} > 0$$

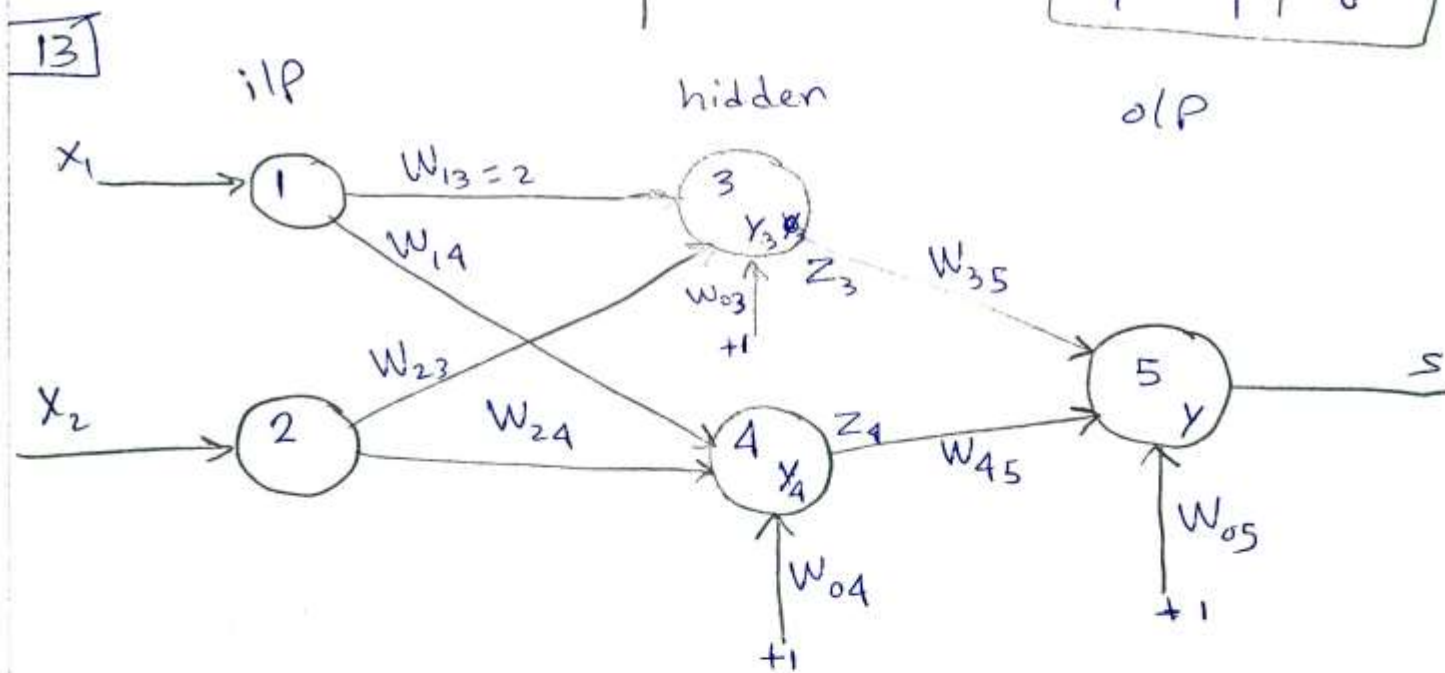
$$W_{13} + W_{23} > A$$

سے لے کر عاثر اُجیب ال (NAND) عجیب مسئلہ ال (AND)
 وَاغیر لشارا ال W_{03} , W_{23} , W_{13} وھذا مع (NOR)

(non linear)



X_1	X_2	S
0	0	0
0	1	1
1	0	1
1	1	0



$$W_{13} = 2, W_{24} = 2, W_{14} = -1, W_{35} = 2, W_{04} = -1.5$$

$$W_{23} = -1, W_{45} = 2, W_{05} = -1.5, W_{03} = -1.5$$

* Prove that this is XOR gate

$$Y_3 = 2X_1 - X_2 - 1.5 \quad \& \quad Y_4 = -X_1 + 2X_2 - 1.5$$

$$Z_3 = P(Y_3)$$

$$\& \quad Z_4 = P(Y_4)$$

$$y = 2Z_3 + 2Z_4 - 1.5 \quad \& \quad s = f(y)$$

a) $X_1 = 0$ & $X_2 = 0$

$$y_3 = -1.5 \Rightarrow Z_3 = 0$$

$$y_4 = -1.5 \Rightarrow Z_4 = 0 \quad \text{Cause } y_4 < 0$$

$$y = -1.5 \Rightarrow s = 0$$

b) $X_1 = 0$ & $X_2 = 1$

$$y_3 = -2.5 \Rightarrow Z_3 = 0$$

$$y_4 = 0.5 \Rightarrow Z_4 = 1$$

$$y = 0.5 \Rightarrow s = 1$$

له باقى التعويضات كما هى وهى متصلة لى ~
الدائرة تعتبر (XOR).

⑧